

8

LIVING THINGS
— MAN

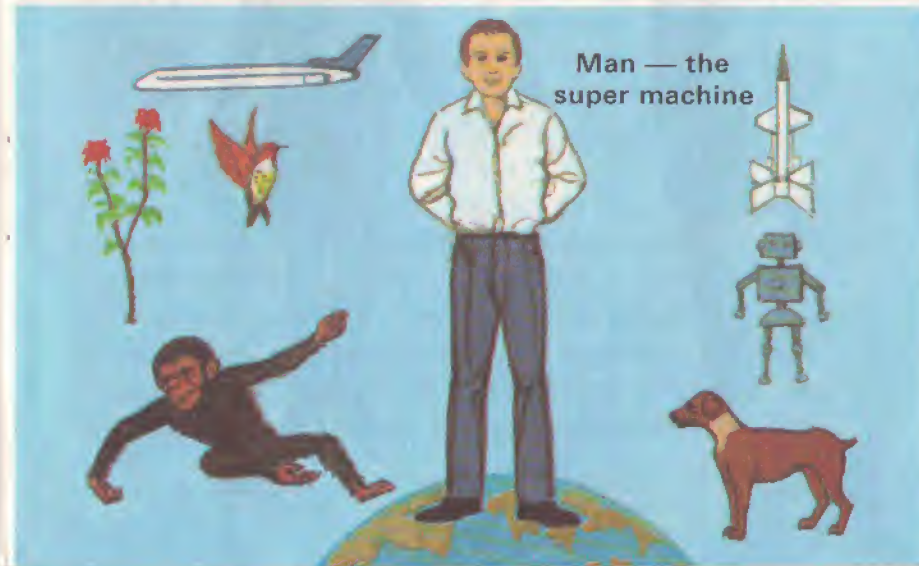
REVISED
EDITION

CONTENTS

	<i>Page</i>
Introduction	5
The bones	6
The joints	9
The muscles	11
The eye	13
The ear	16
The teeth	17
Digestion	21
Respiration	23
The removal of waste products	26
Circulation of blood	28
The nervous system	29
The endocrine system	32

INTRODUCTION

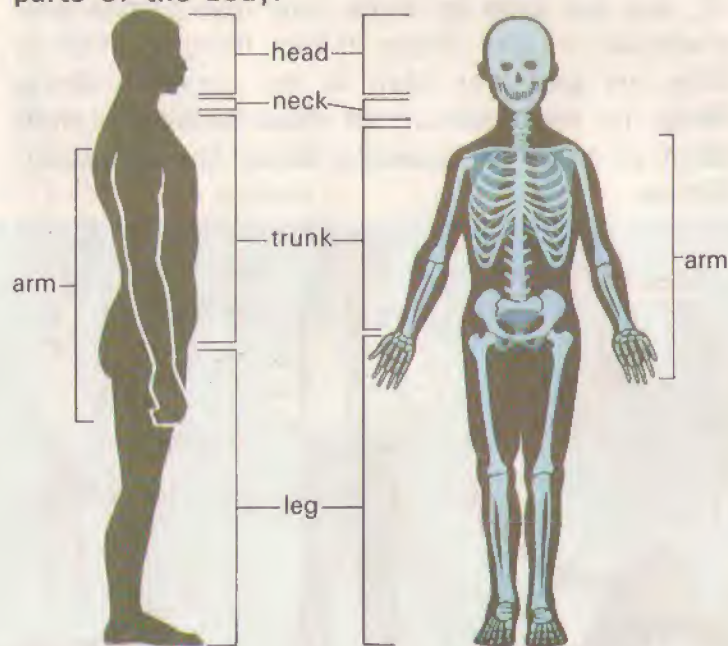
Our bodies are wonderful machines. They have more parts and can do more types of work than any machine in the world. No machine has parts as wonderful as the eye or ear or heart or brain. The most advanced machine cannot grow, mend parts that are injured or reproduce like our bodies can. Above all, we are able to think and love unlike any machine or any other living thing. That is why we say that Man is the supreme living thing in this world. In this book we shall learn as much as possible about our wonderful bodies.



THE BONES

Our bodies are similar in many ways. We may not look exactly alike, but our body shapes are more or less the same. Our bodies are made up of several parts — the **head, neck, trunk, arms** and **legs**. These parts are held together by a framework called the **skeleton**. The skeleton is made up of **bones**. We cannot see our bones because they are covered by our muscles and skin. However, we can feel them.

The skeleton forms a framework for the different parts of the body.



This is an X-ray photograph. Can you see the ribs?

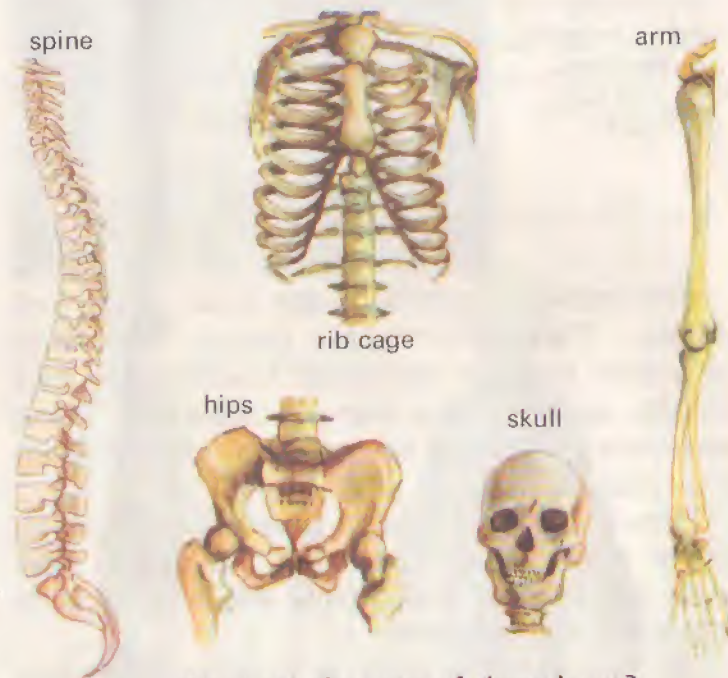


The bones of our body are hard, white and strong. They are not easily broken. If a bone is broken you will see a soft brownish-red part in the centre. This part is called the **bone marrow**. It makes the red and white cells of the blood.

When a bone breaks, new cells begin to grow at the broken ends. More and more new cells are formed until finally the broken ends meet and join together.

To find out if a bone is broken, the doctor uses an **X-ray machine**. This machine can photograph the inside of the body. The photographs it takes are called **X-ray photographs**. Have you ever been X-rayed before? The picture above shows an X-ray photograph of the chest. The ribs can be seen clearly.

The main support of the body is the **backbone** or **spine**. It is made up of a long row of small bones joined to one another. It is found only in the neck and trunk. Animals like fishes, frogs, lizards, birds and dogs have backbones too.



What are the uses of these bone?

Bones not only support our bodies but also help to protect important organs. The **skull** protects the brain. The **ribs** protect the lungs and heart. The **hips** protect part of the food canal. The spine protects the spinal cord.

There are different types of bones in our bodies. Some are flat, some are short, some are long and some are irregular in shape. Can you name such types of bones?

THE JOINTS

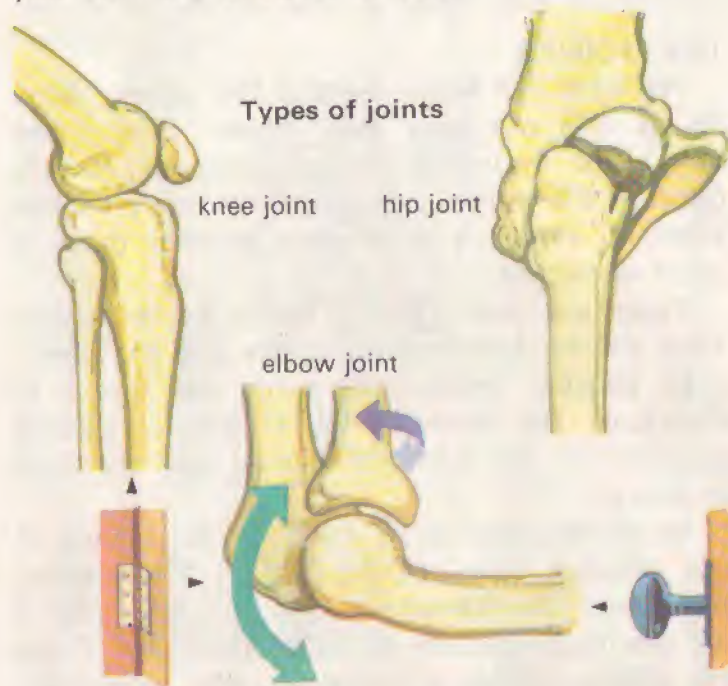
We have just learned about the bones. Now let us find out how they move. Our bodies can make thousands of movements. This is because the bones are not joined firmly to one another. Where a bone joins another bone, a **joint** is formed.

There are two types of joints in the body. They are the **immovable joints** and the **movable joints**. Immovable joints are found in the skull. The bones of the skull fit so closely together at the joints that they are not able to move.

Movable joints allow the free movement of the different parts of the body. The **elbow**, the **knee**, the **shoulder** and the **hip joints** are the main movable joints of the body. There are different types of movable joints. The main types are **hinge joints**, **pivot joints** and **ball-and-socket joints**.

The knee joint is a good example of a hinge joint. It works like the hinge of a door and can only bend backwards. The elbow joint is partly a hinge joint and partly a pivot joint. It is a hinge joint because, like the knee, it can bend in one direction only. It is a pivot

joint because, unlike the knee, it can cause a rotating movement. It allows the lower arm to rotate on the elbow. You can notice this if you turn the knob of a door.



The hip and shoulder joints are ball-and-socket joints. In the shoulder joint, the rounded end or 'ball' of the upper arm bone fits into a cup-like space or 'socket' of the shoulder blade. This allows you to swing your arm freely in a circle.

Besides the different joints mentioned above, do you know of any other joints in your body?

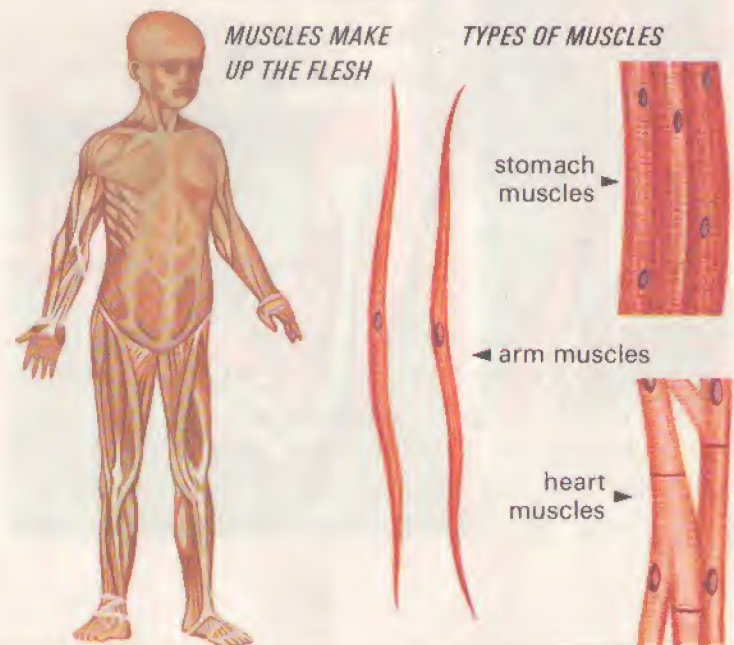
THE MUSCLES

There are more than 600 muscles in your body. They make up the **flesh** that lies between the skin and the skeleton.

• Muscles can contract and relax. Their contraction and relaxation causes body movements.

Many of the muscles of the body are attached to bones and cause their movements. The bones of the upper arm and lower arm, the upper arm and shoulder, the thigh and shin and the thigh and hip are attached to each other by powerful muscles. However, not all muscles are attached to bones. The muscles of your stomach and heart are examples of such muscles.

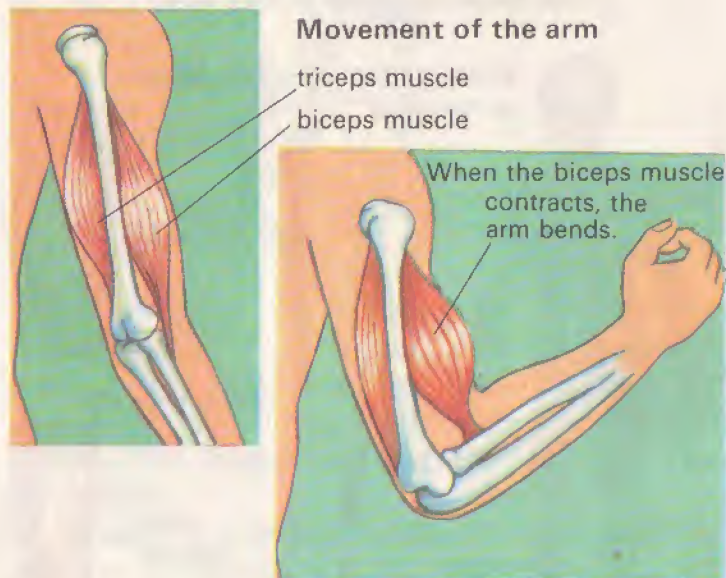
The muscles of the human body



Things to Do

Can you feel the movement of your muscles? You certainly can. Do the following things to find out how your muscles move.

- (a) Hold your upper arm tightly and move your lower arm up and down. Can you feel the muscles pulling? The muscles which help your lower arm to move are the **triceps** and **biceps muscles**. Which muscle contracts when the lower arm moves downwards and which contracts when it moves upwards?
- (b) Lift up a chair. Which of the body muscles move?

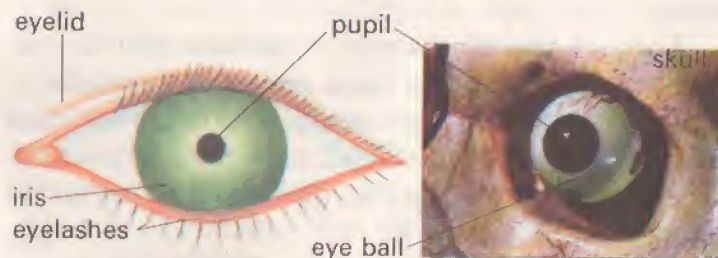


THE EYE

You use your eyes to see things around you. A blind man cannot do so. If you want to know what it is like to be blind, just blindfold yourself. You will find that the world is a dark and gloomy place.

The part of the eye which you can see is only a small portion of the whole eye. The eye is actually about the size of a table-tennis ball. Much of it lies within the skull. The front portion of the eye is made up of three parts — the **cornea**, the **iris** and the **pupil**. It is protected by the **eyelid** and **eyelashes**.

Parts of the eye



The cornea is a transparent white part which surrounds and covers the iris. The iris is the coloured part of the eye. It may be black, blue, brown or green in colour. It is actually a ring of muscles which can contract and relax. The pupil is a round opening in the middle of the iris. It is always black in colour.

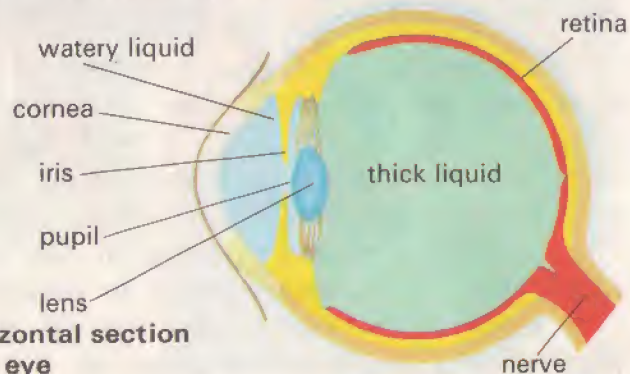
If there is too much light the iris relaxes, thus making the pupil smaller. In this way,



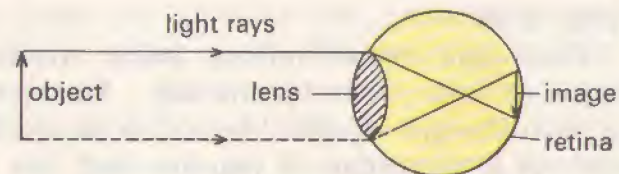
What happens to the eye when there is too much light?

only a certain amount of light can enter the eye through the pupil. If there is too little light, the iris contracts. This makes the pupil bigger. Thus more light is allowed to enter the eye.

Look at the diagram of a section of the eye. Behind the iris is the **lens** which is transparent. There is a space between the lens and the cornea. This space is filled with a watery liquid. There is another space behind the lens and



A horizontal section of the eye



How an image is formed

this is filled with a thick liquid. The layer shown in red is called the **retina**. It lines the space behind the lens and acts like a screen. There is a nerve which connects the eye to the brain.

We see an **object** only when light from that object enters the eye through the pupil. The light then passes through the lens and falls on the retina. An **image** is formed here. A message about the image is then sent to the brain through the nerve.

Since your eyes are so important to you, you should take great care of them. If your eye-sight is good, you will be able to see things clearly. If it is bad, you should see a doctor. Your bad eye-sight can be corrected by wearing a proper pair of spectacles.

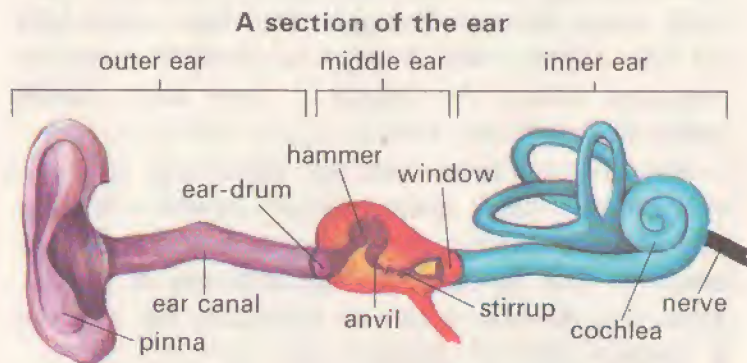
Why is this girl wearing spectacles?



THE EAR

Your ears allow you to enjoy music and listen to what your friends say. You are able to hear danger signals like a fire alarm or the horn of a motor car. If you are deaf, the world around you will be a silent one.

The ear can be divided into three parts — the **outer ear**, the **middle ear** and the **inner ear**. The part of the ear which we can see is known as the outer ear or **pinna**. It is shaped like a funnel. This shape helps it to collect sounds, which are then passed to the inner ear.



The outer ear is connected to the middle ear by a canal called the **ear canal**. At the end of the canal is a tightly stretched piece of skin called the **ear-drum**.

The middle ear lies on the inner side of the ear-drum. It contains three small bones — the **hammer**, the **anvil** and the **stirrup**. These are joined to each other in a chain.

The inner ear contains the **cochlea** which looks like a coiled shell. The cochlea is filled with a liquid. There are nerves in the inner ear which carry sound messages to the brain.

Do you know how you hear the sounds around you? Your outer ear collects the sounds and passes them into the middle ear. The sounds cause the ear-drum to move to and fro, or **vibrate**. When the ear-drum vibrates it makes the chain of small bones vibrate too. This in turn causes the liquid in the cochlea to move. When this happens, sound messages are sent to the brain by the nerves.

Like your eyes, you should take good care of your ears. You should not put sharp objects into your ears. If you do, you may hurt them. If you have an ear-ache or if your hearing is poor, you must see a doctor.

THE TEETH

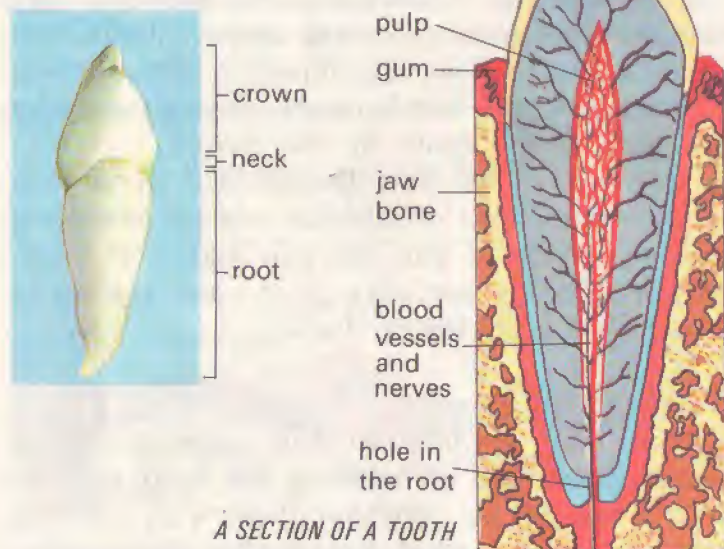
Your teeth are fixed to your upper and lower jaws. They help in breaking the food you eat into small pieces. Without them, you will not be able to eat food like apples, sugar-cane, chocolates, roasted chicken and any other types of food that require chewing before they can be swallowed.

Let us now examine a tooth. The tooth can be divided into three parts — the **crown**, the **neck** and the **root**. The crown is the part which lies above the **gum**. It is covered by a

very hard substance called **enamel**. The neck lies just below the crown. The root is the longest part of the tooth. It is covered by the gum and lies inside the jaw bone.

The structure of a tooth

PARTS OF A TOOTH



A SECTION OF A TOOTH

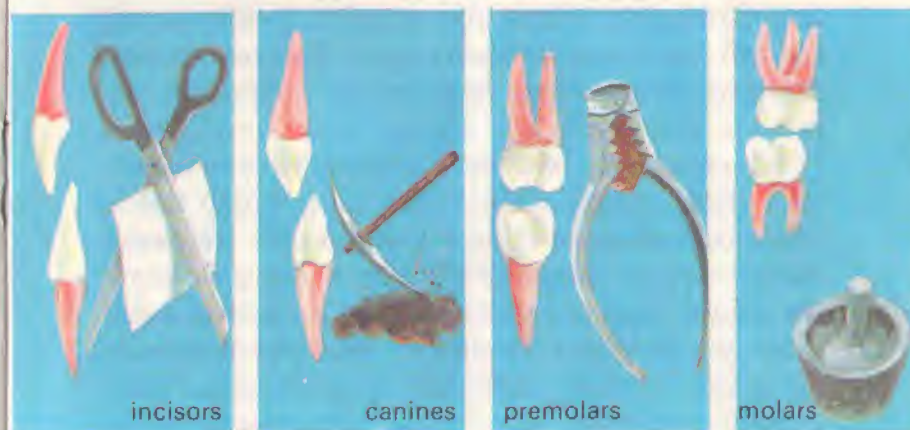
The picture above shows a section of a tooth. Below the enamel lies the **dentine**. The dentine is fairly hard. In the middle of the tooth is a soft part called the **pulp**. The pulp contains many blood vessels and nerves. These leave the tooth through a hole in the root.

Not all your teeth are of the same size and shape. You have four types of teeth. They are the **incisors**, the **canines**, the **premolars** and the **molars**.

The incisors are shaped like chisels. They cut off pieces of food. The canines are shaped like pick-axes. They tear the food into smaller bits. The premolars are not as sharp as the incisors or canines. They are larger and have flat surfaces. They act like nut-crackers and break up food that is hard. The molars are bigger than the premolars and have flat surfaces. Their work is to grind the food that has been broken up into small pieces by the other teeth.

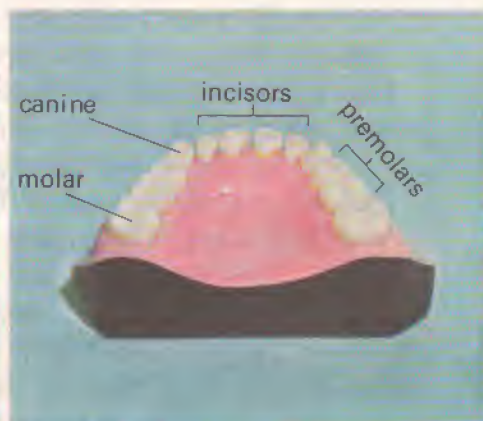
In our lifetime, we have two sets of teeth. The first set is called the **baby teeth** or **milk**

The different types of teeth and their uses





Permanent teeth



Milk teeth

teeth. These grow when we are very young. There are only twenty teeth in this set. They fall out when we grow older and the second set, or **permanent set**, takes their place. There are thirty-two teeth in all. The permanent set begins to grow when you are about eight years old. If you lose a tooth from the permanent set, you will not be able to grow another to take its place.

As your teeth are very important, you must take good care of them. You must brush them every day. Bits of food that get stuck between them must be removed. If not, holes will form. Visit your dentist often to make sure that your teeth are in good condition. Remember that a good set of teeth will add a sparkle to your smile!

DIGESTION

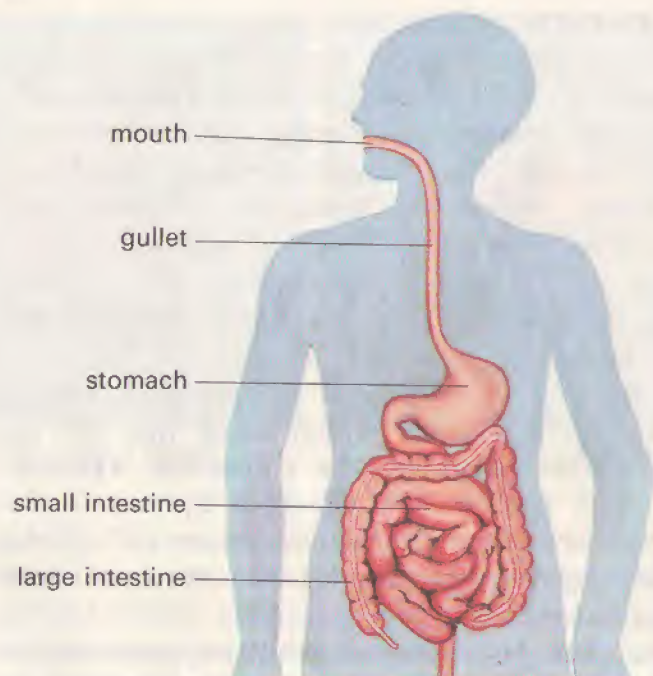
A car needs fuel to move. It will not start without it. Your body also needs fuel to work. This fuel, known as **energy**, comes from the food you eat. Food is also needed to build up the body. The meat, vegetables or other foods you eat have to be broken down into very simple forms before they can be used by the body. The breaking down of foods into simple forms is known as **digestion**.

How is food digested? There is a special system in our body which does this for us. This system is called the **digestive system**. The main part of the digestive system is the **alimentary canal**. This is made up of the **mouth, gullet, stomach** and the **small and large intestines**.

We shall now look at what happens to the food while it passes through this system. In the mouth the teeth cut, crush and grind the food into small pieces while the tongue mixes it. In addition, a special **digestive juice** called **saliva** wets and softens the food.

When the food is soft enough, it is swallowed and goes down the gullet into the stomach. The food may remain in the stomach for some time. The stomach produces other digestive juices which help to digest part of the food.

It takes about three hours for the stomach to become empty again after a meal. It then



The digestive system

rests for some time. When it is time for the next meal, the stomach muscles begin to contract. This makes us feel hungry.

From the stomach, the food is forced through a narrow opening into the small intestine which is a long coiled tube. In the small intestine there are some special digestive juices which help in completing the breakdown of food. The digested food passes through the walls of the small intestine and enters the blood. The blood takes it to all parts of the body.

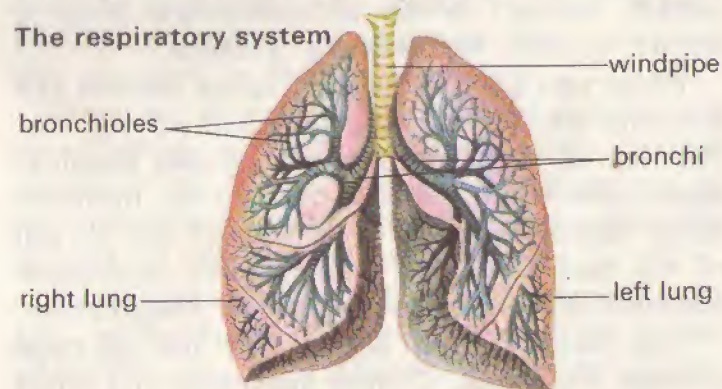
Not all the food we eat is digested. The undigested food, also known as **waste**, is pushed down from the small intestine into the large intestine. From here it leaves the body through the **anus**.

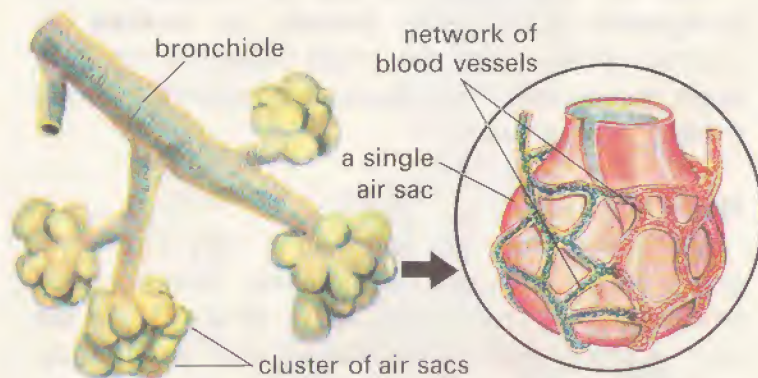
RESPIRATION

We know that air contains a very important gas called **oxygen**. All living things need oxygen. We shall now learn about how we take in the oxygen from the air into our bodies.

You breathe in air through your nose. As air passes through the nose, any dirt and dust that may be present is trapped by the hair inside it. The clean air then passes into your **windpipe** and then down to the chest where the **lungs** are.

Before entering the lungs, the windpipe branches into two tubes called **bronchi**. One tube goes to the right lung while the other



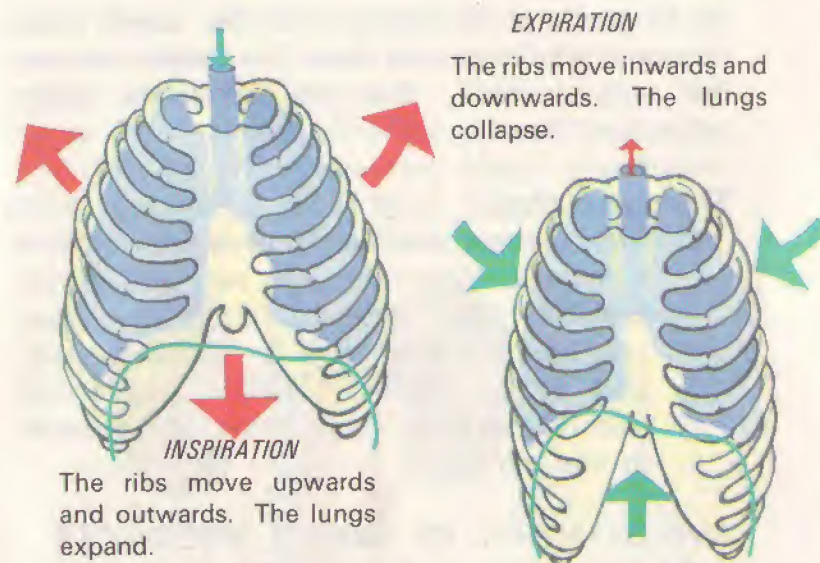


The structure of the air sacs

goes to the left. The bronchi divide into many tiny branches called **bronchioles**. At the end of each bronchiole lies a cluster of very small air bags called **air sacs**. Each cluster looks like a tiny bunch of grapes. Each air sac is surrounded by many tiny blood vessels. This system through which air enters the body is known as the **respiratory system**.

When you breathe in, your lungs expand like balloons which have been pumped up with air. The rush of air into the lungs is called **inspiration**. When you breathe out, the air from the lungs leaves the body. The rush of the air out of the body is called **expiration**. Inspiration followed by expiration is called **respiration**.

You have learned earlier that the rib-cage protects the lungs. During inspiration the lungs



Rib-cage movements during inspiration and expiration

must expand. Therefore, the chest must expand too. This happens when the chest muscles contract to pull the ribs upwards and outwards. During expiration the muscles relax and the ribs go back to their old position.

We need oxygen but we know that the air we breathe in contains other gases besides oxygen. The lungs have an important job to do. They have to take in the oxygen from the air and to get rid of the used air.

Each time we breathe in, air enters the air sacs of the lungs. Oxygen passes from the air sacs into the blood vessels. It is then taken

to all parts of the body. At the same time, the used air is passed from the blood vessels into the air sacs. This air leaves the body when we breathe out.

Things to Do

Most people breathe about eighteen times a minute. When you are very active you breathe faster. Do you know how fast you breathe when you do exercises, run, play or get excited? Get a stop-watch and record how many times you breathe in one minute.

THE REMOVAL OF WASTE PRODUCTS

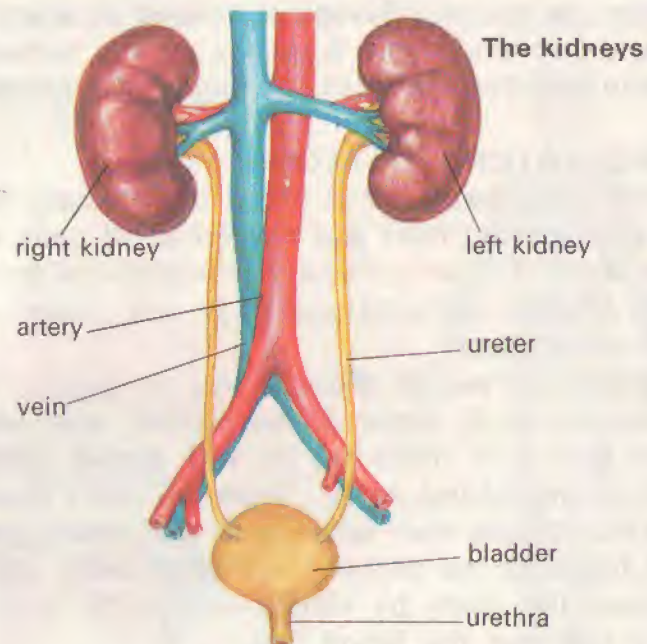
Anything that is not wanted in the body and as a result, is removed by the body, is known as a **waste product**. When we breathe, eat or drink, we may take in some gases, food substances or chemicals that are not needed by the body. These waste products must be removed. If they collect and remain in the body, we may become sick and even die.

The body removes waste products in various ways. We have learned earlier that oxygen is taken into the body when we breathe in. When the oxygen is used up by the body, a waste product is formed. This is a gas called **carbon dioxide**. It is expelled by the lungs when we breathe out.

There are liquid waste products in the body

also. These enter the blood from all parts of the body and are taken to two bean-shaped organs called the **kidneys**. These organs lie below the ribs, one on either side of the spine.

In the kidneys there are many tiny tubes called **tubules**. Tiny blood vessels lie close to these tubules. The liquid waste products



carried by the blood first enter the tiny blood vessels. From here they pass into the tubules. They flow through the tubules into two large tubes called **ureters**. Each ureter leads from the kidney into a bag-shaped organ called the **bladder**.

The liquid waste products flow through the ureter and collect in the bladder. They remain there for some time. They form a liquid called **urine**. When the bladder is full, the urine is forced out of it. It leaves the body through a short tube called the **urethra**.

Waste products are also removed by the body when we sweat. **Sweat** is formed in **sweat glands** in the skin. It comes to the surface of the skin through small openings called **pores**.

CIRCULATION OF BLOOD

We have learned that blood is necessary for taking digested food and oxygen to all parts of the body. It also collects waste products from the different parts of the body and helps to get rid of them.

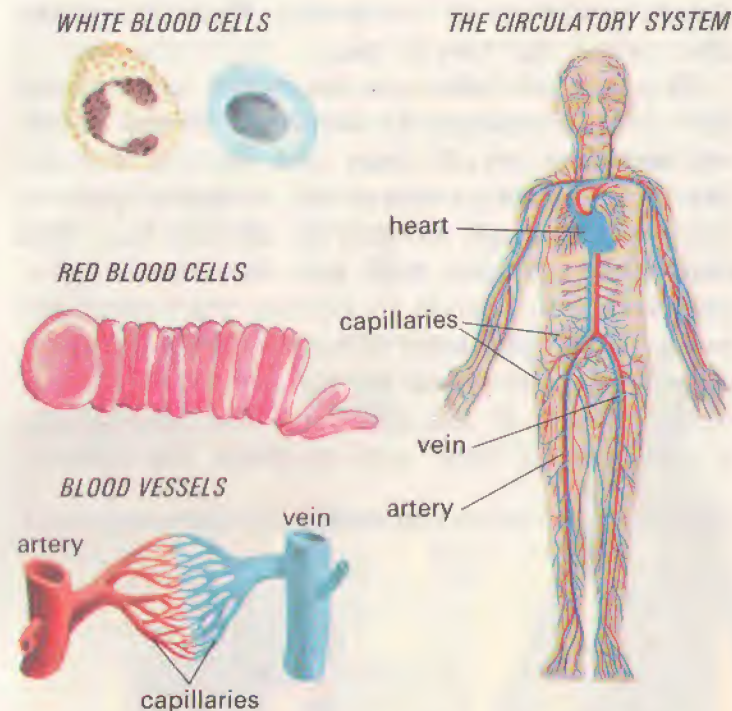
Blood, as we all know, is red in colour. If you look at it under a microscope, you will find that it is made up of **red blood cells** and **white blood cells**. There are many more red blood cells than white ones and these give the blood its red colour. The white blood cells protect the body by killing any germs which may get into the blood.

Blood is pumped by the **heart** through blood vessels to all parts of the body. This is known as **circulation**. Your heart lies in your chest. It is about the size of your fist. It is divided into four chambers.

There are three types of blood vessels in

the body — **arteries**, **veins** and **capillaries**. Arteries carry blood away from the heart, veins carry blood to the heart and capillaries join the arteries to the veins. The heart and the blood vessels make up the **circulatory system**.

The blood and the circulatory system



THE NERVOUS SYSTEM

When you touch a very hot object with your hand, you quickly withdraw your hand. Thus each time you feel pain, a message travels

to your **brain**. How do messages travel from different parts of your body to your brain?

All parts of the body are connected to the brain by **nerves**. Nerves act like telegraph wires. They carry messages from the different parts of the body to the brain. Then the brain decides on what to do, and it sends messages back to the appropriate parts of the body. These messages are carried by nerves too.

The nerves of the eye, ear, nose, tongue and skin carry messages to the brain about things we see, hear, smell, taste and feel. If a noise is too loud, for example, the message gets to the brain through the nerves of the ear. The brain then decides that you must cover your ears with your hands to protect them from the noise. When you want to ring the front doorbell, the nerves of the eyes tell the brain the position of the switch of the doorbell. The brain sends a message to your arm to press the switch.

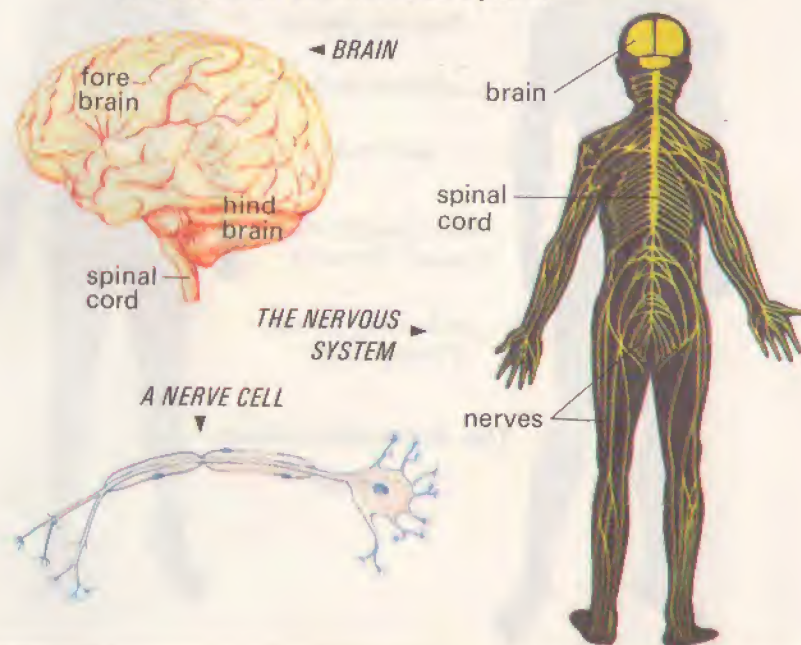
What happens when you want to ring the doorbell?



Most nerves in the body cannot join up directly with the brain. They have to pass through the **spinal cord**. This is linked to the brain. In the same way, messages from all parts of the body must pass through the spinal cord before reaching the brain. The nerves, the spinal cord and the brain make up the **nervous system**. The nervous system is very important because without it we will not be able to feel, smell, taste, hear and see.

The brain is the most important part of the nervous system. It controls the movements of the body and sends out instructions to all parts of the body. It is made up of three parts — the **fore brain**, the **mid brain** and the **hind brain**.

The parts of the nervous system



THE ENDOCRINE SYSTEM

The **endocrine system** is made up of a number of glands which make liquids that go directly into the blood. These liquids contain substances called **hormones**. Hormones act as messengers which travel in the blood to all parts of the body. Hormones have many functions.

Many hormones help the body to carry out its various functions smoothly. Certain hormones control our growth and development. During danger e.g. when you are faced with a charging bull, certain hormones are released into the blood and these prepare us for action.

